DOCUMENT RESUME

ED 067 280 24 SE 014 843

AUTHOR Tinsley, Ian J.; And Others
TITLE Evaluation of an Introductory College Course in Environmental Studies. Final Report.
INSTITUTION Oregon State Univ., Corvallis. Dept. of Agricultural Chemistry.
SPONS AGENCY National Center for Educational Research and Development (DHEW/OE), Washington, D.C.
BUREAU NO BR-I-J-018
PUB DATE Aug 72
GRANT OEG-X-71-0014(057)
NOTE 63p.

EDRS PRICE MF-$0.65 HC-$3.29
DESCRIPTORS Cognitive Tests; *Courses; Educational Research; *Environment; Evaluation; Higher Education; *Measurement; *Perception; Social Sciences; Statistical Data; *Values

ABSTRACT

This paper reports on an evaluation conducted at Oregon State University in 1971 and 1972 for an introductory college course in environmental studies, "Man and the Environment." The course used integrated content and was team-taught by an inter-disciplinary team using several innovative approaches. Subjects were administered an Environmental Knowledge Inventory and an Inventory of Societal Issues (ISI), both as pretests and posttests. Results indicate students taking the course increased significantly in their knowledge of the environment as compared with a control group. In addition, they showed significant attitude changes on four of five factors on the ISI (revised form). These changes are interpreted to mean that the students have become less sure that scientific and technological advances are beneficial to the man-nature interaction and have become more aware that such advances may be detrimental to it; they have become more aware of the complexity of the problems; they are more concerned with the problems of population growth and the need to restrict it; they are less certain that science and technology are capable of solving society's problems; and they are more concerned with individual and personal responsibility and action. (BL)

FINAL REPORT

Project No. 1-J-018
Grant No. OEG-X-71-0014(057)

Ian J. Tinsley, Project Director
Department of Agricultural Chemistry
Oregon State University
Corvallis, Oregon 97331

EVALUATION OF AN INTRODUCTORY COLLEGE COURSE IN ENVIRONMENTAL STUDIES

August 1972

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Office of Education

National Center for Educational Research and Development
(Regional Research Program)

SUMMARY

This is the final report of an EVALUATION OF AN INTRODUCTORY COURSE IN ENVIRONMENTAL STUDIES carried out at Oregon State University in 1971 and 1972. The course used integrated content and was team-taught by an interdisciplinary team using several innovative approaches. The primary evaluation was made on the Winter Term 1972 class.

The method of evaluation and the results were as follows:

1. In a non-equivalent control group design with a self-selected experimental group (students taking the course) a knowledge test prepared by the investigators was used as a pretest and a post-test. Analysis of covariance for the comparison of adjusted mean post-test scores showed that the experimental group had increased significantly in environmental knowledge during the period in which they took the course.

2. Using the same design, a modified form of the INVENTORY OF SOCIETAL ISSUES, originally prepared by R. B. Barnhart and R. L. Steiner, was used as a pretest and post-test. Analysis of covariance for the comparison of adjusted mean post-test scores on the separate factors showed that significant changes were experienced on four of the attitude factors.

Scores increased significantly on:

Factor II. Disillusionment and pessimism regarding the involvement of man in nature, especially through his industrial, scientific, and technological progress.

Factor IV. Concern for the problem of increased population and the resultant problems associated with overpopulation.

Factor V. The necessity of the individual to assume individual responsibility for making personal sacrifices in order to help alleviate social problems.

Scores decreased significantly on:

Factor VI. Optimism and faith in the utility of science and technology to solve the many problems facing mankind.

3. A detailed course evaluation form completed by students indicated a high level of satisfaction with the course content, activities and teaching approach.

4. The faculty teaching team recommended that the course and its teaching approach become a permanent part of the offerings of the university.

The investigators feel that the evidence is clear that the course met its objectives successfully and that its contents and methods might be successfully employed elsewhere.

FINAL REPORT

Project No. I-J-018
Grant No. OEG-X-71-0014(057)

EVALUATION OF AN INTRODUCTORY COLLEGE COURSE IN ENVIRONMENTAL STUDIES

Ian J. Tinsley, Project Director
Department of Agricultural Chemistry

Co-authors of report:

R. Thomas Tanner, Ph.D.
Asst. Prof., Science Education

John J. Sheppy
Research Assistant

Oregon State University
Corvallis, Oregon 97331

August 11, 1972

The research reported herein was performed pursuant to a grant with the Office of Education, U.S. Department of Health, Education, and Welfare. Contractors undertaking such projects under Government sponsorship are encouraged to express freely their professional judgment in the conduct of the project. Points of view or opinions stated do not, therefore, necessarily represent official Office of Education position or policy

U.S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE

Office of Education
Bureau of Research

ACKNOWLEDGEMENTS

The investigators wish to gratefully acknowledge the useful aid and cooperation received from the following people:

Dr. R. B. Barnhart and Dr. R. L. Steiner for permission to use the INVENTORY OF SOCIETAL ISSUES;

The team teaching the course MAN AND THE ENVIRONMENT for their cooperation and for the use of materials they prepared;

Dr. G. F. Craven for the arrangements which provided the control group;

Mr. David Niess for aid and advice in processing of the data.

TABLE OF CONTENTS

APPENDICES

LIST OF TABLES

A. Introduction

1. Scope. The following reports an evaluation conducted on an introductory college course in Environmental Studies. The course was taught as General Science 230X -- MAN AND THE ENVIRONMENT, at Oregon State University in Spring Term 1971 and again in Winter Term 1972. While it was originally intended that a complete evaluation of the course would be made during the initial offering of the course, simple logistics prevented the administration of all the testing instruments delineated in the original proposal.

The greater part of this report deals with results obtained from the class taught during Winter Term 1972. The preliminary results obtained in Spring Term 1971 are also included.

2. Background of the Study. During 1969 and 1970 it became evident that there was much concern on the Oregon State University campus regarding the need for integrated approaches to the study of the environment. Concerned faculty met to discuss possible programs of study. A student group, Eco-Alliance, sponsored seminars for faculty and student interaction regarding alternate proposals.

In February 1970 a task force of about 15 faculty members, representing a wide variety of disciplines, was formed under the chairmanship of Dr. Ian J. Tinsley of the Environmental Health Sciences Center to survey needs and possibilities in this area. The recommendation of this committee, submitted in September 1970, was that the university offer a 4-unit (quarter hour) sophomore level course. The committee provided a statement of general objectives for the course and an outline of appropriate concepts, along with suggested operating procedures. The report of this committee forms Appendix 1.

In October 1970, the decision was made to implement the course in Spring Term 1971. A six member steering committee, under the chairmanship of Dr. Tinsley, was established. Its functions were to select a teaching team, to obtain and allocate financial support and to guide the development and evaluation of the course. United States Office of Education Grant No. OEG-X-71-0014(057) assisted in the implementation of the course and provided funds for the evaluation reported herein.

The teaching team selected for Spring 1971 consisted of:

Dr. David Bella - Civil Engineering
Dr. Ronald Clarke - Religious Studies
Dr. John Lyford - General Science, Biology
Dr. Richard Ross - Anthropology

The research and teaching activities of these faculty members had revealed particular interest and knowledge in environmental areas.

Time considerations made it impossible to evaluate the course fully during this quarter. Because it was felt that the course was

successful it was offered for a second time in the Winter Term of 1972. For this offering of the course Dr. Ronald Clarke, who was on leave from the university, was replaced by the Reverend John Conner of Westminster House (the University Ecumenical Ministry student center). Mr. Conner was also the chairman of a United Presbyterian national task force preparing a statement on population policies.

Progress Reports of this evaluation project were submitted on July 15, 1971 and November 24, 1971.

3. Areas of Evaluation. In evaluating the study it was felt that data from both the cognitive domain and the affective domain and from both students and teaching faculty should be utilized. The following areas were investigated:

(a) Students' knowledge regarding the environment;
(b) Students' attitudes toward the interaction of science and technology with society;
(c) Students' reactions toward the course content and format;
(d) Instructors' reactions toward the course.

4. Hypotheses. The hypotheses which were tested regarding students enrolled in MAN AND THE ENVIRONMENT follow:

(a) Using the preliminary data from Spring 1971.

Hypothesis 1. Students' mean score on Factor II of the INVENTORY OF SOCIETAL ISSUES (ISI) will show a significant increase during the period of the course.

Hypothesis 2. Students' mean score on Factor III of the ISI will show a significant increase during the period of the course.

Hypothesis 3. Students' mean score on Factor IV of the ISI will show a significant increase during the period of the course.

Hypothesis 4. Students' mean score on Factor V of the ISI will show a significant increase during the period of the course.

Hypothesis 5. Students' mean score on Factor VI of the ISI will show a significant decrease during the period of the course.

(b) Using the data from Winter 1972.

Hypothesis 6. Students completing the course will show a significant gain in knowledge of the environment as compared to a control group.

Hypothes 7. Students enrolled in the course will show a significant increase in mean score on Factor II of the ISI as compared to a control group.

Hypothesis 8. Students enrolled in the course will show a significant increase in mean score on Factor III of the ISI as compared to a control group.

Hypothesis 9. Students enrolled in the course will show a significant increase in mean score on Factor IV of the ISI as compared to a control group.

Hypothesis 10. Students enrolled in the course will show a significant increase in mean score on Factor V of the ISI as compared to a control group.

Hypothesis 11. Students enrolled in the course will show a significant decrease in mean score on Factor VI of the ISI as compared to a control group.

B. Methods

1. Instruments. The following sections describe the instruments which were used.

(a) INVENTORY OF SOCIETAL ISSUES (Revised) -- ISI

The INVENTORY OF SOCIETAL ISSUES was developed by R. B. Barnhart, Jr. and R. L. Steiner (Barnhart, 1971; Steiner, 1971) to measure attitudes toward socially significant science related issues. Developed by factor analysis techniques, the instrument contains seven rotated factors or submeasures interpreted by Steiner (1971, p.125-6) as follows:

"Factor I. A regard for human life and those things which may be detrimental to it. The factor content was based on abortion, euthanasia, and drug usage.

Factor II. Disillusionment and pessimism regarding the involvement of man in nature, especially through his industrial, scientific, and technological progress.

Factor III. Concern for the conservation and preservation of our wildlife, wilderness areas, and natural resources.

Factor IV. Concern for the problem of increased population and the resultant problems associated with over population, including degradation of the environment and pollution. Attitudes toward methods of halting population growth were also expressed.

Factor V. The necessity of the individual to assume individual responsibility for making personal sacrifices in order to help alleviate social problems.

3

Factor VI. Optimism and faith in the utility of science and technology to solve the many problems facing mankind. Also expressed was the belief that this is indeed the proper role that scientists, science, and technology should occupy.

Factor VII. Belief in having and granting individual rights and freedoms."

Factors are numbered as they appear in Barnhart's conclusions (1971, p.199).

Reliabilities, based upon a sample of 304 high school seniors, are given in Table 1 below. (Steiner, 1971, p.100).

TABLE 1

RELIABILITIES OF TOTAL ISI AND INDIVIDUAL FACTOR SCALES

Factor	Total no. of items	Pearson Product-Moment Correlation Coefficients*	Spearman-Brown Prophecy Formula Reliabilities	KR-20 Reliabilities
I	8	0.741	0.850	0.804
II	7	0.377	0.548	0.547
III	8	0.477	0.648	0.647
IV	10	0.671	0.805	0.747
V	12	0.688	0.813	0.780
VI	10	0.469	0.638	0.615
VII	5	0.321	0.483	0.382
Total ISI	60	0.624	0.768	0.647

* Correlation of odd-numbered item total with even-numbered item total.

Since the original inventory is broader in scope than required for the study, a revised form of the instrument was prepared at the request of the Internal Clearance Committee of the Office of Education. This form eliminated Factors I and VII of the original instrument, deleted two items and reworded four items. The remaining items were renumbered. It is assumed that these revisions do not seriously affect the reliability and validity characteristics of the instrument or the interpretation of the factors. The revised instrument is included in Appendix 2 along with a table showing the relationship of items to factors. To avoid confusion the factors are numbered as in the unrevised instrument.

(b) ENVIRONMENTAL KNOWLEDGE INVENTORY (EKI) or Test on MAN AND THE ENVIRONMENT

This instrument, for use in the cognitive domain, was prepared by soliciting relevant objective test items from each of the teaching team members and from the investigators. The teaching team members reviewed the items for apparent validity in terms of course content and objectives. Sixty questions were chosen to form the inventory.

During the first week of classes in Winter Term 1972, the EKI was administered to 80 students enrolled in the experimental course, MAN AND THE ENVIRONMENT, and to 128 members of other classes, considered as potential members of a control group. A split-half (odd-even) product-moment correlation coefficient of 0.69 was obtained from this sample. From this the Spearman-Brown Prophecy Formula indicates a reliability coefficient of 0.81.

It was originally intended that this instrument be item-analyzed and that only those items which correlated highly with the total measure be retained. It was decided that this procedure was inapplicable since items which might relate closely to the concepts of the course, but which were unlikely to be part of the general knowledge of individuals prior to the course, would be eliminated.

This instrument is included as Appendix 3.

(c) Student Reaction to the Course

Forms on which students evaluated the various components of the course were prepared by the teaching team. These are included in Appendix 4.

2. Procedure

(a) Spring Term 1971. While time considerations prevented a complete evaluation of the course at this time, the following preliminary evaluation was done:

(i) The INVENTORY OF SOCIETAL ISSUES was administered to the class both as a pretest and as a post-test. The data so obtained were analyzed by 'paired t-tests' on each of the seven factors. This procedure is classified by Campbell and Stanley (1966) as the One-Group Pretest-Post-test Design.

(ii) The students evaluated the course on a prepared form. The data obtained in this way were summarized.

(b) Winter Term 1972. The major evaluation of the project is based upon results obtained during this quarter. The design chosen for the evaluation is that designated by Campbell and Stanley (1966) as the Nonequivalent Control Group Design with a "self-selected" experimental group. This design was chosen primarily to control the factors Campbell and Stanley discuss as 'history' and 'testing'.

In an area such as environmental studies, in which ecological, population and other topics are widely discussed in the popular and student media, without a control group it is invalid to attribute changes in knowledge or attitudes to an experimental course since they may result merely from being alive and alert (Campbell and Stanley's 'history'). Without the control it is also possible to attribute the changes to the experience of taking the pretest.

(i) Following this design, both the INVENTORY OF SOCIETAL ISSUES (Revised) and the ENVIRONMENTAL KNOWLEDGE INVENTORY were administered as pretest and post-test to the students enrolled in the course MAN AND THE ENVIRONMENT (hereafter called the experimental group) and to students in classes chosen to serve as a control group. Different classes were used as controls for the ISI and for the EKI. The data obtained were total scores for the EKI and five factor scores for the ISI. These data were subjected to analyses of covariance using the pretest scores as covariates in order to compare adjusted treatment means.

(ii) The students evaluated the course on a prepared form. The resulting data were summarized.

(iii) The teaching team prepared a report of the course for the Dean of Undergraduate Instruction. Pertinent parts of this report are used, at their request, as the instructors' evaluation.

3. Characteristics of the Groups.

(a) Spring 1971. MAN AND THE ENVIRONMENT Class. The class consisted of 123 students distributed by school and class as in the following table.

TABLE 2

DISTRIBUTION BY SCHOOL AND CLASS OF STUDENTS
IN MAN AND THE ENVIRONMENT COURSE -- SPRING 1971

Enrollment by Schools		Enrollment by Classes	
School	No. Students	Class	No. Students
*H&SS	29	Freshman	40
Science	32	Sophomore	40
Agriculture	18	Junior	24
Bus. & Tech.	18	Senior	17
Education	11	Post Bac.	1
Engineering	3	Special	1
Forestry	3	TOTAL	123
Home Ec.	5		
Pharmacy	1		
Phys. Ed. & Health	3		
TOTAL	123		

*Humanities & Social Sciences

(b) Winter 1972. MAN AND THE ENVIRONMENT Class. Eighty-one students completed the course in this quarter. Their distribution by school and class is shown in Table 3.

TABLE 3

DISTRIBUTION BY SCHOOL AND CLASS OF STUDENTS
IN MAN AND THE ENVIRONMENT COURSE -- WINTER 1972

Enrollment by Schools		Enrollment by Classes	
School	No. Students	Class	No. Students
H&SS	13	Freshman	14
Science	21	Sophomore	22
Agriculture	16	Junior	21
Bus. & Tech.	8	Senior	22
Education	13	Post Bac.	2
Engineering	3	TOTAL	81
Home Ec.	3		
Phys. Ed. & Health	2		
Graduate	2		
TOTAL	81		

(c) Winter 1972. Control Groups. It was the original intention that both the EKI and the ISI be given to a number of sections of General Science 102 -- General Biology, so that only sections with mean scores similar to those of the experimental group might be retained to form a control group. It was foreseen that, in order to maintain the best initial experimental-control equality on each measure, it might be necessary to use different groupings of sections as controls for the EKI and for the ISI.

The above plan was unworkable in practice. The general Biology class had spent the fall quarter dealing with ecology and environmental topics and so were inappropriate for use as a control group.

Reluctance was expressed by instructors when approached for the use of their classes as control students. This arose chiefly from the fact that the use of both instruments twice required two hours out of a term of 30 hours. However, General Science 105 -- Physical Science, and some Chemistry 105 -- General Chemistry, sections were offered for use as controls. It was necessary, however, to administer only one of the two instruments to each section. This reduced the number of potential sections from which a control group could be chosen. Furthermore, all potential control sections had initial mean scores lower than the experimental group on the EKI. At the end of the term, time considerations prevented the Chemistry 105 sections which had written the EKI pretest from writing the post-test. In addition, the post-tests of both EKI and ISI were administered in the last laboratory periods of the term. Absenteeism was high.

For the above reasons, all students who wrote both pretest and post-test of either the EKI or the ISI were retained in the appropriate control group.

The characteristics of those students who finally served as the control groups are presented in the following tables.

TABLE 4

DISTRIBUTION BY SCHOOL AND CLASS OF STUDENTS
IN THE CONTROL GROUP FOR THE EKI

Enrollment by Schools		Enrollment by Classes	
School	No. Students	Class	No. Students
H&SS	10	Freshman	15
Science	1	Sophomore	10
Agriculture	0	Junior	20
Bus. & Tech.	18	Senior	3
Education	16	Post Bac.	1
Home Ec.	4	TOTAL	49
TOTAL	49		

TABLE 5

DISTRIBUTION BY SCHOOL AND CLASS OF STUDENTS
IN THE CONTROL GROUP FOR THE ISI (REVISED)

Enrollment by Schools		Enrollment by Classes	
School	No. Students	Class	No. Students
H&SS	8	Freshman	23
Science	3	Sophomore	22
Agriculture	2	Junior	19
Bus. & Tech.	25	Senior	2
Education	21	No information	4
Engineering	1	TOTAL	70
Forestry	1		
Home Ec.	3		
Pharmacy	1		
Phys. Ed. & Health	4		
No information	1		
TOTAL	70		

As can be seen from the above tables the failure of the Chemistry classes to complete the post-tests resulted in an underrepresentation of Science and Agriculture students in the control group as compared to the experimental group.

4. The Experimental Treatment -- The Course MAN AND THE ENVIRONMENT.

The experimental treatment in the design was the course, General Science 230X -- MAN AND THE ENVIRONMENT. It was offered as an experimental course for four hours credit in Spring Term 1971 and again in Winter Term 1972. The following is a description of the course as it was offered in Winter 1972.

The total class met as a group for one hour sessions on Mondays and Fridays, and for a two hour session on Wednesdays. These sessions were usually lectures by the teaching team members. On one occasion a faculty member, not on the teaching team, served as a resource person. Three outside speakers, representing industry, gave presentations. The second hour on Wednesday was frequently used for class discussion, either with the class as a whole or broken into small groups. A time schedule with the topics covered and with activities is included in Appendix 5.

In addition, the class was divided into 17 groups of members. This division was carried out by the students with the requirement that each group should have a mixture of major subjects represented. Each group met for a minimum of one hour per week at a time mutually agreeable to the group. The group work consisted of the following:

(a) Each member of the group read a book selected from a list (or an approved alternate), discussed it with his group and prepared a critical review based upon the reading and discussion. The review was read and approved by all members of the group.

(b) Each member of the group was expected to attend one or two outside meetings or seminars related to environmental issues. The seminars and meetings were selected from both campus and community activities. Reports of these were given to the group.

(c) Six evening seminars were held at which all members of the teaching team were present. A member from each group attended each of these seminars and reported to his group.

(d) Each group prepared a final group paper entitled, "The United States of America, 2001".

The course also included assigned reading and midterm and final examinations. A field trip was taken to the Albany Sewage Treatment Plant.

The information and assignments given to students form Appendix 6. Further details of the course and the method of grading used are contained therein.

9

C. Results

1. Results Obtained from the ENVIRONMENTAL KNOWLEDGE INVENTORY -- Winter 1972.

The statistical null hypothesis corresponding to Hypothesis 6 was tested by an analysis of covariance using pretest and post-test scores on the ENVIRONMENTAL KNOWLEDGE INVENTORY for both the experimental and control groups. This analysis is shown in Tables 6 and 7.

TABLE 6

ANALYSIS OF COVARIANCE FOR THE COMPARISON OF ADJUSTED MEAN SCORES ON ENVIRONMENTAL KNOWLEDGE INVENTORY. (PRETEST IS COVARIATE)

Source	df	SSy	MSy	F
Treatments	1	1907.19	1907.19	64.33
Error	108	320.99	29.65	
Total	109	2228.18		

$F_{0.01}$ (1, 108) = 6.88

TABLE 7

ADJUSTED MEANS ON EKI POST-TEST

	N	Pretest Mean	Post-test Mean	Adj. Post-test Mean
Experimental Group	62	33.89	41.27	39.67
Control Group	49	29.12	28.80	30.83

From the above data one can reject the statistical null hypothesis of no significant difference between the adjusted means of the treatment group and the control group with a high degree of probability. The experimental group -- those taking MAN AND THE ENVIRONMENT -- performed significantly better on the EKI than did the control group after adjustment for initial differences and our Hypothesis 6 is confirmed.

2. Results Obtained from the INVENTORY OF SOCIETAL ISSUES.

(a) Spring 1971. Hypotheses 1 to 5 were tested by the use of a paired t-test for the significance of differences between the pre-test and post-test scores. In this analysis the factor score is an average factor score based upon the total factor score divided by the number of items in the factor. Since the post-test was administered on a day of low attendance only 51 usable pairs of pretest and post-test results were obtained. The results of these tests are shown in Table 8.

TABLE 8

PAIRED t-TESTS OF DIFFERENCES IN PRETEST AND POST-TEST ISI SCORES

Factor	Pretest Mean	Post-test Mean	Difference in Means	t-Value
II	3.389	3.529	0.140	1.920
III	3.838	3.904	0.066	0.947
IV	3.212	3.404	0.192	3.119
V	3.439	3.668	0.229	4.461
VI	2.769	2.672	0.097	-1.512

$t_{0.05}(50) = 1.676$

$t_{0.01}(50) = 2.403$

$t_{0.001}(50) = 3.262$

Table 8 indicates that the statistical hypothesis of no significant difference must be rejected for Factors II, IV and V at the usual level (0.05). Since the direction of change is as predicted in our hypotheses there were significant increases in the mean scores on these factors. We reject our Hypotheses 2 and 5, and Hypotheses 1, 3 and 4 are confirmed.

(b) Winter 1972. Hypotheses 7 to 11 were tested by analyses of covariance using the pretest scores as the covariate and post-test scores as the criterion measure with both control and experimental groups. The results of these analyses are presented in Tables 9 and 10.

TABLE 9

ANALYSIS OF COVARIANCE FOR THE COMPARISON OF ADJUSTED MEAN SCORES ON THE FACTORS OF THE ISI (REVISED)

(Pretest is Covariate)

	Source	df	SSy	MSy	F
FACTOR II	Treatments	1	1.93	1.93	9.81
	Error	117	23.07	0.197	
	TOTAL	118	25.00		
FACTOR III	Treatments	1	0.12	0.12	0.69
	Error	117	20.58	0.176	
	TOTAL	118	20.70		
FACTOR IV	Treatments	1	5.88	5.88	35.48
	Error	117	19.38	0.166	
	TOTAL	118	25.26		
FACTOR V	Treatments	1	0.776	0.776	5.85
	Error	117	15.51	0.133	
	TOTAL	118	16.29		
FACTOR VI	Treatments	1	1.20	1.20	9.50
	Error	117	14.81	0.127	
	TOTAL	118	16.01		

$F_{0.05}$ (1, 117) = 3.92

$F_{0.01}$ (1, 117) = 6.86

12

TABLE 10

ADJUSTED MEANS ON ISI POST-TEST

	Group	N	Pretest Mean	Post-test Mean	Adjusted Post-test Mean
FACTOR II	Experimental	51	3.38	3.59	3.54
	Control	69	3.21	3.24	3.28
FACTOR III	Experimental	51	3.99	3.77	3.62
	Control	69	3.60	3.57	3.68
FACTOR IV	Experimental	51	3.30	3.72	3.71
	Control	69	3.27	3.26	3.26
FACTOR V	Experimental	51	3.50	3.71	3.59
	Control	69	3.26	3.35	3.43
FACTOR VI	Experimental	51	2.66	2.49	2.67
	Control	69	3.08	3.03	2.89

The above analyses enable us to reject the statistical null hypothesis at the 0.05 level for all factors except Factor III. This indicates that there were significant changes in the attitudes measured by Factors II, IV, V and VI in the experimental group as compared to the control group. Table 10 indicates that the direction of these changes were increases on Factors II, IV and V, and a decrease on Factor VI. The interpretation of the changes is in the following section.

Hence, our Hypothesis 8 must be rejected. Hypotheses 7, 9, 10 and 11 are confirmed.

A comparison was made of the pretest scores of the experimental and control groups by use of a 'two sample t-test'. The results are given in Table 11.

TABLE 11

COMPARISON OF PRETEST MEANS ON THE ISI OF EXPERIMENTAL AND CONTROL GROUPS FOR STUDENTS WITH BOTH PRETEST AND POST-TEST DATA

Experimental N = 51
Control N = 69

Factor	Experimental Group Pretest Mean	Control Group Pretest Mean	t-Value for Comparison of Means
II	3.38	3.21	1.56
III	3.99	3.60	4.14 **
IV	3.30	3.27	0.27
V	3.50	3.26	2.86 **
VI	2.66	3.08	-4.96 **

$t_{0.05}$ (118) = 1.662

** $t_{0.01}$ (118) = 2.368

3. Discussion of the Meaning of the Statistical Results Obtained on the EKI and on the ISI.

In both the preliminary results from Spring 1971 and the more complete results of Winter 1972, Factors II, IV and V were shown to change significantly for students in the MAN AND THE ENVIRONMENT course. The significant result obtained in Winter 1972 on Factor VI is hinted at by the size of the t-value in the earlier results. The following discussion amplifies the meanings of the factors and the significance of the changes.

Steiner's (1971, p.79-81) description of Factor II is:

"This factor seems to reflect a rather disillusioned and pessimistic attitude toward the outcomes and implications of the relationship of man to nature, with his science and technological progress and achievements....

"A high score on this factor would reflect an attitude that the results of many technological advances are not good, and have created more problems than they have solved; therefore, they conclude that nature is a thing with which man should not tamper."

On this factor the experimental group (Winter 1972) changed from a mean score of 3.38 (not significantly different statistically

from the control group) to a mean of 3.59. The change was significant. This change would seem to indicate that the students in the MAN AND THE ENVIRONMENT course became less certain that science and technology contribute positively to the interaction of man with nature. Perhaps they have become more aware of the problems caused by these agents.

Steiner's (1971, p.81-84) description of Factor IV is:

"Factor IV clearly reflects a concern for the problem of increased population and the implications or consequences of this increase. Also contained within the factor are attitudes on methods of dealing with or combatting the increasing population. Agreement with the factor would be indicative of a great concern for our increasing population, and a belief that population is the cause of many of our social problems including pollution and famine which, they feel, will inevitably occur. Factor agreement would also indicate the attitude that our population growth must be halted.... A variety of population control methods would be considered favorable...."

While the majority of revisions, excepting the elimination of Factors I and VII, between the original ISI and the revised form were made upon this factor, the above description appears to be still valid.

On this factor the experimental and control groups had nearly identical pretest means, but the experimental group showed a highly significant change from a mean of 3.30 to one of 3.72 during the period of the course. This change is in the direction of greater concern with population problems and their consequences and an increased feeling that population growth must be halted.

Barnhart's (1971, p.109) description of Factor V follows:

"The attitude model developed for this factor was a need to take personal responsibility for societal woes. An individual achieving a high score on this factor would support a move toward fewer, more efficient automobiles used less often and disposed of by the owner. Fireplaces and incinerators, pesticides and large families, representing conveniences and luxuries, would be perceived as considerations that should be secondary to society's needs. In all of this, he would lament the lack of personal responsibility shown by those who desire the conveniences and would recommend encouragement and/or requirement that those, who directly benefit, take action to alleviate problems caused by their actions."

On this factor the experimental group had a significantly higher mean on the pretest than did the control group. This would indicate that prior to the course they had greater concern for individual and personal responsibility and action with respect to environmental problems. This could be expected of a group which voluntarily enrolled in such a course. During the period in which they took the course, the students' concern in this area was significantly increased, the mean score going from 3.50 to 3.71.

It is to be hoped that the concern expressed will be converted into commitment to individual action.

Steiner's (1971, p.92) comment on Factor VI is:

Factor VI "is clearly a science and technology factor. The items suggest an optimistic belief in the ability of science and technology to solve societal problems and deficiencies in our environment. Not only is an optimism expressed, but also the attitude or belief that this is indeed the proper function of science and technology."

In comparison with the control group, on the pretest, the experimental group was significantly less optimistic that science has or is capable of finding answers to all of society's problems. During the course, the students became even less optimistic. Perhaps this is the result of understanding the complexity of the problems and the difficulty of producing a united attack upon them.

It is interesting to note that significant changes were not found in Factor III, which deals with a concern for conservation and preservation of wildlife, winderness areas and natural resources. Examination of the data shows that in this area the experimental group students were very significantly more concerned, at the time of the pretest, than were those in the control group. Their initial high mean score in this respect implies an already formed attitude.

While it is tempting to attribute the significant changes on the EKI and on the ISI factors to the effect of the experimental course, certain cautions must be noted. Campbell and Stanley (1966) list a number of factors which must be discussed relating to the internal validity of the above results since some of these might present plausable alternative explanations for the effects noted. These relate to the areas of history, testing, selection and several possible interactive effects.

The chief problems in this evaluation relate to selection. The experimental group was self-selected. The students sought out the experience of the course. The control groups were unlike the experimental group in this respect. Furthermore, due to problems in recruiting the control groups, the backgrounds of these groups differed from that of the experimental group as shown in Tables 3, 4 and 5. The pretest means of the control groups were significantly different from those of the experimental group on the EKI and on three of the five ISI (Revised) factors. It is impossible to state whether this was due to the differing backgrounds, the self-selective process, or to a combination of these.

When intact groups which are not randomly assigned to treatments are used the assumptions of the analysis of covariance may not be met.

The significant changes obtained on Factors II, IV and V of the ISI in the Spring of 1971 could possibly be attributed to 'history' or 'testing' instead of being attributed to the course. By 'history' in this case it is meant that, over the 10-week period between pretest and post-test, the group may have experienced a set of events, apart from the course, which would produce the changes in attitude noted. 'Testing' means that the experience of the pretest may affect the way in which the student takes the post-test. He may feel that he has discerned the purpose of the test, or that he knows which are acceptable answers, and so his test-taking behavior may change.

Neither 'history' nor 'testing' presents a plausible explanation of the results from the EKI or ISI in Winter 1972. The minor decline in the control group mean on the EKI and the very small changes of the ISI factor means for the control group indicate that neither 'history' nor 'testing' by itself has had an effect.

Possible interactive effects which might be invoked as alternative explanations are:

(a) Interaction of selection and history. The explanation here would be that, while ecological events in our environmentally conscious world did not affect the knowledge or attitudes of the control group, for those students who were actively seeking such knowledge (hence self-selected themselves for the course) the non-class events of the quarter were sufficient to produce the change.

(b) Interaction of selection and testing. Here the explanation would be that only the environmentally interested students were affected by the pretest in such a manner that the post-test behavior was changed.

It seems to the researchers involved that the simplest, and hence the preferable, explanation of the changes is that they were produced by the activity of taking the course with the caution that the significant effects noted might not have been produced on a group not self-motivated to take the course.

Whether the results obtained could be generalized to other situations is uncertain. The treatment itself was complex and unique, having components related to the course content, to the methods by which it was taught and to the personalities of the instructors.

4. Student Reaction to the Course -- Spring 1971.

Students' reactions to the course were solicited by distribution of the evaluation form, Appendix 4a. Only 40 students were present on the day this form was distributed since at the end of the course attendance was made optional as most students were working on projects. Tables 12 to 21 show the percentages of responses to each item, which students were requested to rate on a scale (A,B,C,D,F). Percentages

are used in this and the following section to enable the reader to make comparisons between the results from the two years, if he desires. In the ensuing discussion A plus B ratings will be called 'above average' and D plus F ratings will be called 'below average'. In addition to ratings, the form solicited free comments regarding each of the items and provided a space for other comments and suggestions.

Examination of Tables 12 to 16 shows that the students reacted very favorably to the course with the majority (often a preponderance) of the students rating the course above average (A or B) on nearly all items. A further indication of satisfaction is that 85% would recommend the course to others without qualification and a further 7.5% would do so with some qualification.

TABLE 12

STUDENTS' REACTION TO READING -- SPRING 1971

AUTHOR & TITLE	A	B	C	D	F	No Comment
BATES The Forest and the Sea	35	42.5	17.5	2.5		2.5
COLE The Ecosphere	20	42.5	22.5	7.5		7.5
CROWE The Tragedy of the Commons Revisited	7.5	32.5	20			40
DEEVEY The Human Population	5	15	40			40
DISCH The Ecological Conscience	17.5	40	20	15	2.5	5
EHRENFELD Biological Conservation	7.5	35	15	2.5		40
HARDIN The Tragedy of the Commons	22.5	32.5	17.5			27.5
SEARS The Ecology of Man	15	42.5	22.5	7.5		12.5
OVERALL	16.2	35.3	21.9	4.4	0.3	21.9

With respect to Table 12, Reading, the 'No Comment' column often indicates that the student did not read this work. If responses

in this column were subtracted from the total, the percentage of those who read the work reacting favorably to it is increased. Additional written comments indicated that the reading was favorably received.

Table 13 shows that the segment of the course dealing with principles of ecology was highly popular and was considered very relevant by the students. From the written comments it seems that this part of the course was found to be most interesting by those who did not have strong biology backgrounds. Two students felt that the reading might have coordinated with the lectures better. One felt that solutions and alternatives might have been explored further.

TABLE 13

STUDENTS' REACTION TO 'PRINCIPLES OF ECOLOGY' -- SPRING 1971

	A	B	C	D	F	No Comment
Amount of Material	25	37.5	35			2.5
Correct Level of Presentation	22.5	42.5	20	10		5
Success in Helping You Learn the Subject Matter	37.5	25	25	2.5		10 *
Relevancy	50	32.5	10	5		2.5
OVERALL RATING	33.7	34.4	22.5	4.4		5

* Includes comments by 2 students (5%) that since they had taken Ecology courses previously they already knew this material.

The part of the course dealing with the historical, cultural and ecological development of man was also well received, if not quite so popular as the preceding. Written comments were roughly equally divided between those who wished less emphasis in this area and those who wished more. The most frequent comment was a request for greater stress on the religious aspects of culture and their implications for the issues. Table 14 records students' responses in this area.

TABLE 14

STUDENTS' REACTIONS TO 'HISTORICAL, CULTURAL AND ECOLOGICAL DEVELOPMENT OF MAN' -- SPRING 1971

	A	B	C	D	F	No Comment
Amount of Material	10	35	40	7.5		7.5
Correct Level of Presentation	15	42.5	25	7.5		10
Success in Helping You Learn the Subject Matter	10	40	35	5	2.5	7.5
Relevancy	30	30	25	7.5		7.5
OVERALL RATING	16.3	36.9	31.2	6.9	0.6	8.1

Table 15 shows students' reactions to three other components of the course. Among those who rated it, the field trip was considered very worthwhile. All written comments but one were favorable. Several felt that more field trips would be helpful and a few suggested locations for such.

As offered in Spring Term 1971, the course had a final project of the students' own choice. This was one of the most popular ingredients of the course, 55 percent of the students rating it as excellent. Of students writing comments, 17 out of 25 were highly laudatory of the practice. A few indicated that they preferred a more structured assignment.

Class discussions were valued by the majority of students, but there was a significant minority which rated this aspect of the course less favorably than any other. In their written comments students expressed the thought that the group was too large and that the teaching team or other students tended to monopolize the discussion. Several members of the class suggested that the class be broken into discussion groups for better participation.

TABLE 15

STUDENTS' REACTIONS TO OTHER ASPECTS OF THE COURSE -- SPRING 1971

	A	B	C	D	F	No Comment
Field Trip	37.5	32.5	7.5			22.5
Final Project	55	20	25			
Informal Classroom Discussions	30	22.5	30	17.5		

Students rated the instructors very highly on all items. Their written comments indicated an appreciation of the variety provided by a teaching team. They liked the integrated approach to knowledge. Table 16 indicates students' rating of the instructors.

TABLE 16

STUDENTS' REACTIONS TO THE INSTRUCTORS -- SPRING 1971

	A	B	C	D	F	No Comment
Helpfulness	40	37.5	15	2.5		5
Knowledge	75	25				
Enthusiasm	75	20	2.5			2.5
Ability to Communicate	52.5	40	5			2.5
OVERALL RATING	60.7	30.6	5.6	0.6		2.5

Several students took advantage of the space provided and wrote extended comments, making concrete suggestions and occasionally minor criticisms. There was some feeling that the course was not suitable for students of all backgrounds.

Two, not atypical, comments follow:

"I gained a much broader perspective of what the ecology crisis is. Before taking this course I placed all my faith in science and technology to save us. But now I realize how complex the problems really are."

"I thoroughly enjoyed the course as a study of man. I found the historical aspects or factors of our present day problems fascinating."

The evidence of the student survey is that the general reaction to the course was very good. Students found it interesting, challenging and relevant. They enjoyed the team teaching approach used and found the variety of viewpoints presented stimulating. From the students' points of view the course was a success.

5. Student Reaction to the Course -- Winter 1972.

Student opinions were again solicited. The evaluation form used is the one in Appendix 4b. The format and rating scale were similar to those discussed above. A total of 73 of the 81 students completed the form. The written comments were analyzed more thoroughly

on this questionnaire. They were grouped into categories reflecting areas of concern related to each item rated and were further assigned into "favorable or positive", "neutral or mixed", and "unfavorable or negative" categories as perceived by the research coordinator. The unit so categorized was the phrase or clause expressing a reaction. Hence, in a response containing several statements each statement would be categorized.

(i) Reading Material. The responses to this section of the evaluation form are found in Table 17. Over one-half of the students (58.6%) rated the assigned reading for the course as above average. However, the response to individual books varied greatly. While The Forest and the Sea, The Ecosphere and Jackson's Man and the Environment were highly rated (60-74 percent felt that they were above average), Boughey's Man and the Environment was far less popular. All 12 students who wrote comments on the interest or style of this book commented negatively, whereas eight out of nine students commenting on the interest or style of The Forest and the Sea commented positively. A few students felt that there was too much assigned reading and some wished class discussion of the books read.

TABLE 17

STUDENTS' REACTIONS TO READING MATERIAL -- WINTER 1972

	A	B	C	D	F	No Comment
The Forest and the Sea	43.8	30.2	17.8	6.8		1.4
The Ecosphere	20.5	41.1	31.5	1.4		5.5
Man and the Environment (Boughey)	6.8	26.0	37.0	24.7	5.5	
Man and the Environment (Jackson)	21.9	43.8	27.4	6.9		
OVERALL REACTION	23.3	35.3	28.4	9.9	1.4	1.7

(ii) Class Lectures. Over half of the students rated the lectures as above average. They particularly felt that the correct level of presentation had been achieved. (These results are contained in Table 18.) Despite this overall satisfaction, those who wrote free comments tended to be critical. In particular the anthropological content was mentioned as being too heavily emphasized and the least relevant part of the course. Four students felt that the overall sequence of lectures was not well organized.

TABLE 18

STUDENTS' REACTIONS TO CLASS LECTURES -- WINTER 1972

	A	B	C	D	F	No Comment
Amount of Material	13.7	38.4	39.7	5.5		2.7
Correct Level of Presentation	23.3	41.1	28.7	5.5	1.4	
Success in Helping You Learn the Subject Matter	17.8	37.0	37.0	6.8		1.4
OVERALL REACTION TO LECTURES	18.3	38.8	35.1	5.9	0.5	1.4

(iii) Outside Speakers. Except for one of the books and the mid-term examination, this aspect of the course received the lowest rating although one of the speakers was very favorably received. However, analysis of the written responses indicated that this was largely reaction to the viewpoints the speakers presented and not to their presence as part of the course. Students felt that the speakers were biased (11 made this comment) and not open to opinions in conflict with the economic interests of their companies. Several commented that the concept of using outside speakers was good and five students expressed the wish that there had been more. One speaker was criticized widely for the format of his presentation. Table 19 presents student reactions to the speakers.

TABLE 19

STUDENTS' REACTIONS TO OUTSIDE SPEAKERS -- WINTER 1972

	A	B	C	D	F	No Comment
Speaker 1	5.5	13.7	39.7	20.6	2.7	17.8
Speaker 2	20.6	46.6	16.4	10.9		5.5
Speaker 3	5.5	16.4	34.3	27.4	10.9	5.5
OVERALL REACTION TO SPEAKERS	10.5	25.6	30.1	19.6	4.6	9.6

(iv) Group Process. Table 20 presents the students' reactions to most of the other components of the course.

TABLE 20

STUDENTS' REACTIONS TO OTHER COURSE COMPONENTS -- WINTER 1972

	A	B	C	D	F	No Comment
Group Process	26.0	35.6	20.6	10.9	5.5	1.4
Book Reviews	28.8	37.0	24.6	8.2	1.4	
Evening Meetings with Instructors	27.4	37.0	23.3	5.5		6.8
Class Discussions	16.4	48.0	32.9	2.7		
Midterm Examination	8.2	32.9	27.4	26.0	4.1	1.4
Field Trip	35.6	35.6	15.1	6.9		6.8
Attendance at Outside Seminars	24.6	37.0	30.2	4.1	2.7	1.4
Final Group Paper	28.8	28.8	27.4	10.9	4.1	

The majority of students (61.6%) rated the group activity as an above average experience for their college careers. Written comments were mostly (14 out of 19) in favor of the activity, but there were mixed comments regarding the way it worked in practice. Some students expressed the need for more faculty guidance and contact with the groups. Some groups found that they contained members unwilling to cooperate. There was some resentment expressed regarding the group grading process. One perceptive student, who incidently rated this aspect of the course as "C", made the following comment:

"I truly enjoyed working with a group and I definitely think this should be continued. This group work is a vital part of life and through it we learn that some people will cooperate and others will not. We learn how to attempt to work with such problems. Faults are present in this situation also. Some people will not or possibly cannot pull their own weight. When others are penalized for this it is wrong....."

This comment expresses some of the satisfaction and most of the criticism of the method. It goes further than most in recognizing these as common elements of life.

(v) Book Reviews. The general reaction was that this was a satisfactory course activity. Nearly two-thirds of the students rated it as an above average experience.

(vi) Evening Meetings with Instructors. This too was favorably received (64.4 percent -- above average). All 12 students commenting on the concept were impressed by the opportunity afforded. Some students found it difficult to arrange to attend these meetings. Some felt that

the discussions on these evenings were instructor dominated and student participation not as great as it should have been.

(vii) Class Discussions. Nearly two-thirds of the students reported this as an above average experience. There were comments that the class size hampered discussion.

(viii) Midterm Examination. As one might predict this was not a very popular component of the course. Written comments were mostly negative, primarily criticizing the examination for stressing too much factual detail. One might speculate upon what sort of examination students would rate highly.

(ix) Field Trip. Except for the instructors themselves, this activity was the most highly rated aspect of the course, 71.2 percent rating it as above average. In addition, almost all written comments were favorable. Eight students suggested that more field trips would be useful.

(x) Attendance at Outside Seminars. Sixty-two percent of the responses rated this as an 'above average' experience. Written comments confirmed this -- 19 out of 26 comments were favorable and two neutral. Most students felt that the seminars were very relevant to the topics of the course and several commented that they revealed areas of study and action unknown to them.

(xi) Final Group Paper. Although they did not rate it as high as some components of the course, the majority of students (57.6 percent) felt that this was an above average activity. As they did with the group process, most students in written comments expressed the feeling that the concept of this assignment was meritorious. The areas of criticism were the lack of cooperation of their fellow students and the partial dependence of their grade upon the quality of the work of others.

(xii) Instructors. Table 21 shows that the instructors received very high ratings from the students. A few students would have preferred to rate instructors individually rather than as a team.

TABLE 21

STUDENTS' REACTIONS TO INSTRUCTORS -- WINTER 1972

	A	B	C	D	F	No Comment
Helpfulness	41.1	41.1	15.1			2.7
Knowledge	60.3	35.6	1.4			2.7
Enthusiasm	64.4	28.8	2.7	1.4		2.7
Ability to Communicate	38.4	46.6	10.6	1.4		2.7

(xiii) Other Comments or Suggestions. Among the more frequently mentioned items were the following:

(1) Several students commented favorably on the variety of teaching-learning experiences employed in the course.

(2) Seven students felt that the workload in the course was too great.

(3) Some students would have preferred a smaller class.

(4) Several students suggested topics or areas they felt would add to the course. Among these were:

(a) methods of individual action.

(b) group projects toward environmental improvement.

(c) more consideration of current environmental action.

The following are a very few of the comments:

"One of the better learning experiences I've encountered at Oregon State University. The variety of ways material is presented and absorbed really make the difference -- in many cases they helped reinforce each other."

"Four-instructor approach is great. So is small group approach. So much energy and knowledge flowing back and forth. My favorite class!"

"....I think student follow-up will be more important than what was originally offered in class. I gained some very basic and all important interests from this class and am willing to participate in getting into environmental issues."

And half humorously:

"Class should be given during spring term. During winter you are hostile toward nature since it only rains and rains and !!!"

The evaluators' interpretation of the above is that students were very satisfied with this course and that a large fraction of them were enthusiastic. The willingness of the teaching team, particularly Dr. Lyford, to prepare a reaction form allowing students to scrutinize the course activities so minutely encouraged students to express their criticisms as well as their commendations. Students were careful in their evaluations. Most students expressed reactions ranging from A to D or F; there was very little evidence that particular students felt this was a C (for example) course and rated all items as C. The overall impression from the reaction sheets is that most students felt that the course was one of the best educational experiences they have had. This is exemplified by their response to the final question: "Would you advise a friend to take the course?" Seventy percent answered "Yes" to this question. Only 12.3 percent replied with a "No".

Of the 17.8 percent who did not circle either "Yes" or "No", 6.8 percent indicated a qualified "Yes". The placement of this question on the form seems to have allowed some students to miss it.

6. Instructor Evaluation of the Course.

The following is from a report written by Dr. Richard Ross, after consultation with the other members of the teaching team, and directed to the Dean of Undergraduate Instruction at Oregon State University:

MAN AND THE ENVIRONMENT is the result of approximately two years of planning and numerous committee meetings prior to the actual teaching. It was first taught during spring quarter 1971; at that time there were four faculty members involved in the actual teaching: David Bella (Civil Engineering), Ronald Clarke (Religious Studies), John Lyford (General Science), and Richard Ross (Anthropology).

The course was organized with the idea that students should get basic information dealing with man and the environment so that reasonable evaluations based on factual data could be made later. In other words, the course was designed to steer clear of the high voltage emotionalism which so frequently surrounds the subject of environment and man's use or misuse of it. Subjects with high emotion were brought up in class but these subjects were not the main thrust of the course. Each participating faculty member utilized material with which he was most familiar. This allowed a wide variety of factual material plus a wide range of philosophical thought to be presented in class.

The course was taught a second time during the winter quarter 1972. At that time there were three faculty members participating: David Bella (Civil Engineering), John Lyford (General Science), Richard Ross (Anthropology), and an individual from off-campus, John Conner (Westminster House). I might say at this point that John Conner with his ministry background and a somewhat more subjective viewpoint than the other participants contributed very substantially to the form and content of the course.

During the winter quarter (1972) the format of the course was changed considerably from the previous spring. This was done to try and remedy the rough spots found in the first quarter and also to accommodate the particular talents of John Conner. The goals of the course remained essentially the same -- to provide students at the lower division level some basic information about ecology, and man's interaction with the environment, both natural and cultural.

The general overall outline has remained the same both quarters.

I. The Ecology of Human Origins and subsequent development

II. Basic Concepts of Ecology

III. Modern Problems Concerning Man and the Environment

The course as a whole has been approached as an experimental course with a great deal of flexibility. This flexibility has worked well in the past and we would assume that it will work well in the future. We feel that the ability to change the format and content of the course itself is one of its strongest assets. This allows for maximum use of talents available from the individuals involved and means that we are not locked into a particular theme or direction. The following is a brief discussion of some of the varying aspects of the course.

a. How to integrate philosophies and information from four different disciplines into a reasonably well designed course using these disciplines to their best advantage. (The organization requirements take an inordinate amount of planning time). The interdisciplinary aspect of the course has been extremely educational to the instructors as well as being beneficial to the students in presenting varying points of view about a given subject.

b. How to deal with classes that are relatively large yet allow or interest the students in becoming individually and personally involved in the subject matter. This we feel is an extremely important part of the course. A number of methods were utilized to involve the students in the subject matter.

c. How to draw on resources both inside and outside the university to the best advantage for course content. (i.e., a number of speakers from off-campus were brought in to represent the industry point of view).

The instructors feel that MAN AND THE ENVIRONMENT is a very worthwhile course and should be placed on a permanent basis within the university.

D. Conclusions.

The purpose of this study was to evaluate AN INTRODUCTORY COURSE IN ENVIRONMENTAL STUDIES. The results reported in the previous section show the following:

1. The students taking the course increased significantly in their knowledge of the environment as compared with a control group.

2. The students taking the course showed significant attitude changes on four of the five factors on the INVENTORY OF SOCIETAL ISSUES (Revised) as compared with a control group. These changes are interpreted to mean that the students have become less sure that scientific and technological advances are beneficial to the man-nature interaction and have become more aware that such advances may be detrimental to it; that they have become more aware of the complexity of the problems; that they are more concerned with the problems of population growth and the need to restrict it; that they are less certain that science and technology is capable of solving society's problems; and that they are more concerned with individual and personal responsibility and action.

3. The students felt that the experience of the course was valuable, that it was very well taught, interesting and relevant.

4. The teaching team felt that the interdisciplinary aspect of the course worked well, that they were able to solve many of the problems of integration of content and teaching approach, and that they were able to get students individually involved. They feel that the course deserves a permanent place in the university.

The evaluators feel that the program has been successful and that other institutions may find similar programs and similar teaching approaches valuable.

29

REFERENCES

Barnhart, Richard Burton Jr. Attitudes of secondary school science and non-science teachers toward certain science related societal issues. (Doctoral dissertation, Oregon State University). Ann Arbor, Mich.: University Microfilms, 1971. No. 71-27,849.

Campbell, Donald T. and Julian C. Stanley. Experimental and quasi-experimental designs for research. Chicago: Rand McNally, 1966.

Steiner, Robert Lewis. A factor analytic study of the attitudes of Oregon high school seniors toward socially significant science related issues. (Doctoral dissertation, Oregon State University). Ann Arbor, Mich.: University Microfilms, 1971. No. 71-19,912.

Appendix 1.

AN UNDERGRADUATE COURSE CONCERNED WITH MAN AND HIS ENVIRONMENT

Course Objectives and Content

This course should provide a comprehensive approach to environmental problems such that students will obtain an understanding of their origin, balanced perspective on their significance and some concept of alternatives available for their solution. The end result, one would hope, would be an informed, responsible citizen who would have some feeling for the contributions made by various disciplines in the definition and solution of these problems.

The enclosed outline summarizes important topics which should be introduced, not necessarily in the order given. Many, if not most, of these concepts are covered in other courses, but not in the same context nor with the same perspective.

Presentation

1. The breadth of subject matter requires that the course be team taught.

2. Participating faculty should be effective teachers, competent in their field, and willing to accept the real concept of a team approach. This would involve contributing to the development of the course as well as a continuing association throughout its presentation in the interest of continuity. At all cost the course should not degenerate into a "parade of stars".

3. In light of the diverse background of the students, those teaching would need to be careful to avoid the technical "jargon" of their field in the development of the basic concepts.

4. If possible class size should be restricted to a maximum of 250 so that those teaching can retain some level of rapport with the class. Weniger Hall 151, with its good audio-visual facilities, would be probably the best location. More than one section would thus be necessary if the demand approaches expectations.

Administration

1. The course should be offered at the Sophomore level with no prerequisites.

2. It should be acceptable either as Science or Social Science credit to assist students in fitting such a course into their programs.

3. Initially it should be offered as a 4-credit course. This recommendation is obviously a compromise considering the material that is to be covered. A 5-credit course with 5 lectures a week could be too much too soon for both students and staff. A 2-term sequence of 3 credits a term would not seem feasible for fiscal reasons.

4. For the present, the course could be nominally scheduled through General Science although, ideally, it should be classified as a "University Course".

5. A steering committee (5 members) with broad campus representation should have the general oversight of the course including budgetary matters, selection of the teaching team, etc. It would seem appropriate to name 3 members of the original planning group to the steering committee in the interest of continuity. The team would be responsible for the specifics of presenting the course with one member being designated as leader.

- - - - - - - - - - - - - - - -

MAN AND THE ENVIRONMENT

(Course Outline)

This course would be offered at the sophomore level as a general university course with no prerequisites. Its major emphasis would be the interaction of man with his environment, the problems which ensue and approaches which might be used in their solution. It will be necessary to develop in this context some concepts of the nature of the biosphere as well as the nature of man in this biological framework.

The following is a brief outline of some of the concepts which should be developed:

I. The Biosphere

Evolution and Adaptation
Biological Complexity, Morphological Adaptation

Populations
Growth, Regulation, Gene Pool, Genetic Variation

Ecosystems
Community Structure and Diversity, Succession, Material Cycles, Energy Flow, Food Webs, Biogeochemical Cycles

Resources
Energy and Material -- Renewable, Non-renewable, Carrying Capacity

II. Man -- Biological and Behavioral Considerations

Ecology of Human Origins

Environment and Early Civilizations -- Development of Cultures -- Environment and Development of Particular Traits

Carrying Capacity, Resource Utilization and Cultural Shifts

Evolution of Inter-relationships

Human Adaptability -- Biological -- Cultural

Environmental Implications of Value Systems, Life Styles, World Views

32

III. Interaction of Man and Environment

Population Growth
Birth and Death Rates -- Age Structure -- Cultural Influences -- Carrying Capacity

Resource Utilization

Technology
Growth and Economic Systems -- Relations to Cultural Systems and Values
Benefits and Costs

Effect of Man on His Environment
Distribution and Transport of Pollutants -- Air, Land, Water
Food Chain Effects
Toxicology and Modification of Natural Systems

IV. Approaches to Solutions

It is proposed that actual case studies would be analyzed with reference to the following:

Ecosystem Stability
Aesthetics and Quality of Life
Resource Conservation
Economics

Framework for Operation -- Categories for Solutions

Political
Legal
Biological
Technological
Socio-cultural

Appendix 2(a).

IDENTIFICATION [ ]

INVENTORY OF SOCIETAL ISSUES -- Revised

KEY: SA ☐ Strongly Agree; A ☐ Agree; N ☐ Neutral; D ☐ Disagree; SD ☐ Strongly Disagree

(Place an X in the space which best indicates your opinion)

		SA	A	N	D	SD
1.	Environmental Quality is generally neglected when economic considerations are involved	☐	☐	☐	☐	☐
2.	Science and technology should attempt to control the weather	☐	☐	☐	☐	☐
3.	The population growth of the United States should be halted	☐	☐	☐	☐	☐
4.	Conservationists' pleas for total protection of an area rich in natural resources (e.g. Alaska) are unrealistic	☐	☐	☐	☐	☐
5.	Since population growth is a critical problem facing mankind it is preferable to not have more than two children	☐	☐	☐	☐	☐
6.	Family size is a family decision	☐	☐	☐	☐	☐
7.	There is no social problem so complex that it cannot be solved once science and technology are committed to its solution	☐	☐	☐	☐	☐
8.	Science and technology often create products and services that man does not really need	☐	☐	☐	☐	☐
9.	Pollution of the environment is due to an unaware, unconcerned, and uncommitted public citizen	☐	☐	☐	☐	☐
10.	Our current cities are a lost cause; we need entirely new experimental cities	☐	☐	☐	☐	☐
11.	Automation holds the promise of the future with new abundance for all, new leisure and new freedoms	☐	☐	☐	☐	☐
12.	Selected wilderness areas should be preserved from man's technological utilization no matter what the cost	☐	☐	☐	☐	☐
13.	We must eliminate the use of pesticides to ensure the health and safety of man, domestic animals and wildlife, even though this will result in poorer crops	☐	☐	☐	☐	☐
14.	In order to encourage a lower birth rate single people should be assessed much lower taxes	☐	☐	☐	☐	☐
15.	Private citizens should not be allowed to burn rubbish and trash in outdoor incinerators because of their contribution to air pollution	☐	☐	☐	☐	☐
16.	We should strive to made advances in genetics to give man the ability to rid himself of hereditary defects, traits, etc.	☐	☐	☐	☐	☐
17.	Technological devices which make it easier for man to exploit nature should be banned	☐	☐	☐	☐	☐
18.	The automobile is incompatible with our health and well being	☐	☐	☐	☐	☐
19.	Incentives should be developed which encourage small families rather than large ones	☐	☐	☐	☐	☐
20.	Computers with their storage and retrieval capacities represent a serious threat to the privacy of the individual	☐	☐	☐	☐	☐
21.	When nature is deficient in doing what it should for human welfare, science and technology must make up for that deficiency	☐	☐	☐	☐	☐
22.	The cost of automobile disposal should be paid by the auto owner, not by society as a whole	☐	☐	☐	☐	☐
23.	It has been suggested that this country determine which countri are beyond help population wise. Massive surplus food efforts would then be directed toward other areas with a greater hope of success	☐	☐	☐	☐	☐
24.	It is not justifiable to set aside large expanses of marketable timber area for recreation	☐	☐	☐	☐	☐
25.	Man should not tamper with the grandeur of nature	☐	☐	☐	☐	☐
26.	The primary objective of the working scientist is to improve human welfare	☐	☐	☐	☐	☐

34

INVENTORY OF SOCIETAL ISSUES (Cont.)	SA	A	N	D	SD
27. Citizens should not be allowed to use fireplaces in pollution prone areas	☐	☐	☐	☐	☐
28. After cuting redwood forests, a higher yield, faster growing tree, like fir, should be used for reforestation	☐	☐	☐	☐	☐
29. In order to keep raw materials from being used up too fast, an international authority must be established to ration them	☐	☐	☐	☐	☐
30. Technology's positive contribution to our lives far outweighs the negative	☐	☐	☐	☐	☐
31. Considering the problems of pollution and crowding, we need to decrease the use of the automobile as a major means of transportation	☐	☐	☐	☐	☐
32. There is no point in attempting to take nature back to pristine purity	☐	☐	☐	☐	☐
33. Science can never solve the problems which are really important to man	☐	☐	☐	☐	☐
34. A federal department of population and environment should be set up with the power to take whatever action is necessary to establish reasonable policies toward the population and environment of the U.S.	☐	☐	☐	☐	☐
35. To reduce petroleum consumption, only small, efficient atuomobiles should be manufactured	☐	☐	☐	☐	☐
36. The oceans represent an almost limitless source of food and resources for the future	☐	☐	☐	☐	☐
37. Land should be utlized in such a manner that the most people benefit from its ultimate use, even if it means giving up already preserved areas	☐	☐	☐	☐	☐
38. America, in the near future, will be filthy and foul, and our air will be unfit to breathe	☐	☐	☐	☐	☐
39. Man's vast technological abilities should be used to put water where people want to be	☐	☐	☐	☐	☐
40. To reduce the number of cars on the road, commuters should not be allowed to drive to work alone unless it is a real necessity	☐	☐	☐	☐	☐
41. The size of our current population can be associated with religious beliefs	☐	☐	☐	☐	☐
42. It is unfortunate that there are fewer and fewer areas in this country where man has never set foot	☐	☐	☐	☐	☐
43. Science and technology will probably develop new foods that can be mass produced to feed the world's hungry	☐	☐	☐	☐	☐
44. Until technology can make substantial reduction in autopollutants, families should be encouraged to have only one automobile	☐	☐	☐	☐	☐
45. Extinction of some species of wildlife is a necessary result of man's involvement with nature	☐	☐	☐	☐	☐

35

Appendix 2(b)

The relationship of items to factors in the
INVENTORY OF SOCIETAL ISSUES (Revised)

Factors	II	III	IV	V	VI
Items	8	4	3	1	2
	17	9	6	5	7
	20	12	14	10	11
	25	24	19	13	16
	33	28	23	15	21
	38	32	29	18	26
	42	37	34	22	30
		45	41	27	36
				31	39
				35	43
				40	
				44	

Scoring Procedure:

All items except those listed below were scored

5 - Strongly agree
4 - Agree
3 - Neutral
2 - Disagree
1 - Strongly disagree

Items 4, 6, 24, 28, 32, 37 and 45 were scored

1 - Strongly agree
2 - Agree
3 - Neutral
4 - Disagree
5 - Strongly disagree

36

Appendix 3.

ANSWER SHEET

Environmental Knowledge Inventory

Identify yourself by the last four digits in your social security number . . . . . [ ]

GENERAL INFORMATION:

State your school and major _____

Year in college (circle one) - Freshman Sophomore Junior Senior

List college biology courses you have taken:

_____

_____

_____

Answer the questions on the accompanying "Environmental Knowledge Inventory" below.

Part I. True-False	Part II. Multiple Choice	Part III. Matching
1. T F	1. a b c d	1. _____
2. T F	2. a b c d	
3. T F	3. a b c d	2. _____
4. T F	4. a b c d	
5. T F	5. a b c d	3. _____
6. T F	6. a b c d	
7. T F	7. a b c d	4. _____
8. T F	8. a b c d	
9. T F	9. a b c d	5. _____
10. T F	10. a b c d	
11. T F	11. a b c d	6. _____
12. T F	12. a b c d	
13. T F	13. a b c d	7. _____
14. T F	14. a b c d	
15. T F	15. a b c d	8. _____
16. T F	16. a b c d	
17. T F	17. a b c d	9. _____
18. T F	18. a b c d	
19. T F	19. a b c d	10. _____
20. T F	20. a b c d	
	21. a b c d	11. _____
	22. a b c d	
	23. a b c d	12. _____
	24. a b c d	
	25. a b c d	13. _____
		14. _____
		15. _____

ENVIRONMENTAL KNOWLEDGE INVENTORY

Answer ALL questions on the answer sheet provided.

Part I. True-False Question.

Answer on the answer sheet by circling T for a true statement, F for a false statement. Do not guess wildly, omit questions of which you are totally unsure.

Are the following statements true or false?

1. Energy is cycled throughout the ecosystem.
2. A natural water body will always have the dissolved oxygen concentration at the saturation level.
3. Icecaps and glaciers contain more water than all of the world's fresh water lakes, rivers, and streams.
4. On a geological time scale, lakes go through an aging process.
5. The atmosphere is warmed primarily by absorption of radiation directly from the sun.
6. Plastics and synthetic materials contribute to pollution by requiring much energy in their manufacture.
7. Plastics and synthetic materials contribute to pollution by being difficult to decompose.
8. When the temperature of water increases, the saturation concentration of dissolved oxygen in the water also increases.
9. The greatest vertical variation of temperature within most deeper Oregon lakes generally occurs during the summer.
10. It is generally believed that a decrease of species diversity will increase the stability of an ecological system.
11. A dissolved oxygen concentration of 8 mg/l is too low for most fish.
12. Lake Erie is an example of a lake where aquatic life has been nearly completely eliminated.

13. A major objective of a sewage treatment plant is to reduce the oxygen demand of the waste.

14. The biological processes occurring in a sewage treatment plant digestor occur in the absence of dissolved oxygen.

15. If water from a stream is used as a coolant, a nuclear power plant will release less waste heat to the stream than a conventional (coal) power plant. (Assume both plants have the same capacity and are both new.)

16. One of the first steps in a conventional sewage treatment plant is to kill the bacteria in the sewage.

17. Most human social institutions have rural rather than urban origins.

18. Large scale urbanization is a relatively recent trend in human social development.

19. In industrial cities slums tend to be dispersed to peripheral areas while in newer developing cities they are in central areas.

20. Until recent times life expectancies in rural areas were greater than in urban areas.

Part II. Multiple Choice Questions.

In the following questions select the option which best answers the question or completes the statement. ANSWER ON THE ANSWER SHEET by circling the letter corresponding to your choice.

1. In an environment which included an exotic (man made) chemical, which member of the living system would most likely contain the highest concentration of that chemical?

   a) green plant
   b) plant eater
   c) meat eater

2. SST is . . .

   a) an airplane
   b) a defoliant
   c) a detergent additive
   d) a pesticide

3. Which chemical has been implicated as a threat to many birds, especially to predator and scavenger birds such as eagles and condors?

   a) 2-4-5 T
   b) DDT
   c) mercury
   d) STP

4. "Environmental succession" is a phrase used in the discussion of

   a) the success of governmental environment programs
   b) the contemporary environment as studied by ecologists
   c) the orderly and predictable sequential community changes of an ecosystem
   d) the successive genetic adaptation of primates to their changing environment

5. The average conversion of incident solar energy into chemical compounds by land plants is of the order of . . .

   a) less than 3%
   b) about 7%
   c) about 15%
   d) greater than 20%

6. Significant quantities of solar energy enter the biological cycle by

   a) photosynthetic processes only
   b) photosynthetic processes and thermal exchange (absorption)
   c) thermal exchange processes only
   d) photosynthetic, thermal exchange and radioactive processes

7. The existence of a substantial quantity of oxygen in the atmosphere is best attributed to

   a) the slow decomposition of silica (SiO_2)
   b) it is a residue from the formation of the earth
   c) the photolysis of water (splitting of water molecules by light)
   d) the photosynthetic action of plants

8. The combustion of fossil fuels requires oxygen and the large increase in our use of these fuels for energy

   a) has already reduced the level of oxygen in the atmosphere
   b) will eventually result in a significant reduction in atmospheric oxygen
   c) will hardly produce a detectable change in atmospheric oxygen
   d) will produce no change in atmospheric oxygen levels

9. All other things being equal, an increase in organic material within an aquatic ecosystem will most likely result in

   a) a decrease in dissolved oxygen
   b) no change in dissolved oxygen
   c) an increase in dissolved oxygen
   d) a decrease in carbon dioxide

10. In general, during what part of the day will the dissolved oxygen concentration be highest in an aquatic environment?

   a) midnight
   b) early morning
   c) midday
   d) late afternoon

11. Man adapts to a new environment

   a) by changing genetically
   b) by cultural adaptations
   c) by extrasensory perception
   d) by not changing

12. Man began first large-scale interference with the environment when

   a) he started manufacturing tools
   b) he became a very effective hunter and killer of other animals
   c) he domesticated plants and animals and started urban centres
   d) industrialization became an accomplished fact

13. Man began to effectively change his natural environment

   a) 200 years ago
   b) 10,000 years ago
   c) 100,000 years ago
   d) 2,000,000 years ago

14. At the birth of Christ there were approximately 1/4 billion people on the earth. By 1850 the human population had reached one billion. Presently on the earth there are approximately

   a) 1 billion people
   b) 3 billion people
   c) 5 billion people
   d) 7 billion people

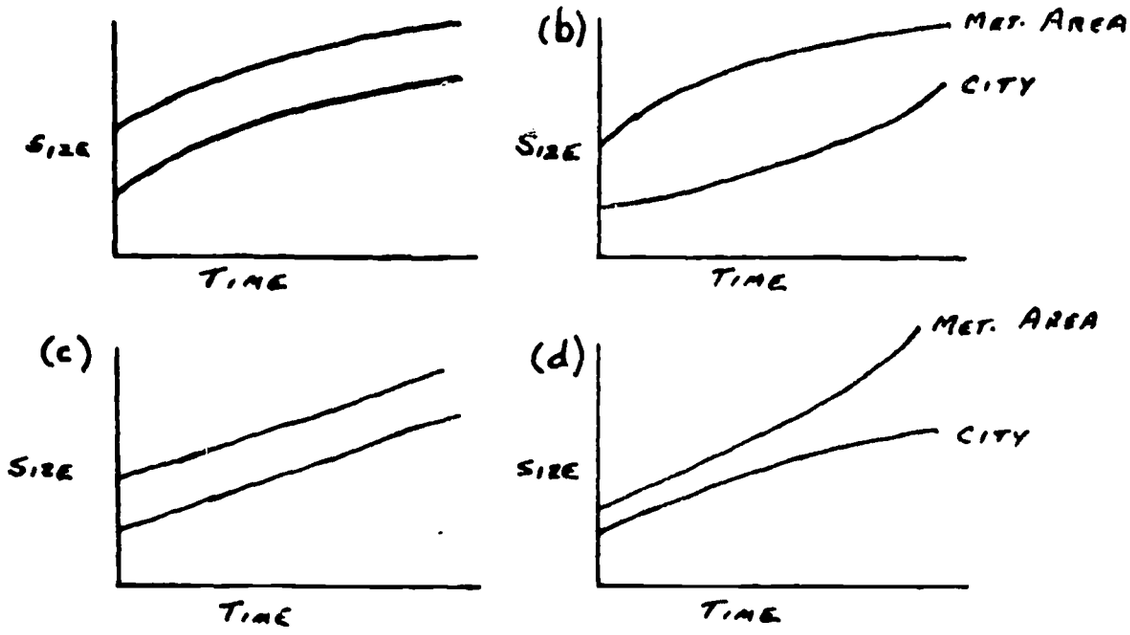
15. According to current estimates, the population of the world in the year 2000 will approximate

   a) 3 billion
   b) 5 billion
   c) 7 billion
   d) 9 billion

16. When speaking of the environment we often refer to a "cowboy economy" which means

a) we are interested in cattle raising as a primary food source
b) we are speaking about a peculiar frontier philosophy - new resources are always on the horizon when the present ones are gone
c) we must return to a life style similar to the cowboy life style in order to survive
d) we are interested in the relationships between horses and cows in an economic sense

17. Which of the following graphs best indicates the growth of a typical North American city and its surrounding metropolitan area in the twentieth century?



18. Until recent times cities have grown chiefly . . .

a) by migration from rural areas
b) because excess of births over deaths was significantly greater in urban than in rural areas
c) because average life spans were longer in cities than in rural areas
d) all of the above

19. In the cities of modern undeveloped nations city growth is primarily due to

a) migration from rural areas
b) general population growth (excess of births over deaths)
c) immigration from other lands
d) changing the political boundaries of cities

20. The Industrial Revolution was primarily due to . . .

a) the application of chemistry to industrial processes
b) the invention of textile making machinery
c) new metallurgical techniques
d) the development of devices which used fossil fuels for power

21. The world's first cities arose

a) as garrison towns for Alexander the Great's army
b) as Mediterranean seaports
c) in highly humid tropical regions
d) in mid-latitude, alluvial river valleys

22. Which of the following is not a potential problem with nuclear power plants?

a) thermal pollution
b) smoke pollution
c) waste disposal
d) radiation pollution

23. On several recent occasions fishing has been forbidden or fish sales stopped because of high levels of which of the following in fish?

a) lead
b) hexachlorophene
c) thalidomide
d) mercury

24. The chief problem resulting from the use of phosphates in detergents is

a) the phosphates over-fertilize water bodies into which wastes flow
b) that the resulting concentration of phosphorus poisons many important species
c) the detergents are toxic and consequently dangerous to young children
d) the phosphates are suspected of causing birth defects in animals

25. Which of the following does <u>not</u> seem to pose a threat of mercury pollution?

a) use of mercury compounds as fungicides in agriculture
b) use of mercury in manufacturing processes
c) use of mercury in pharmaceuticals and dentistry
d) use of mercury in metallurgical processes

Part III. Matching Question.

Choose the most appropriate response from the right hand column to match each item in the left hand column. Answer on the Answer Sheet by placing the appropriate letter beside the number.

1. _____ range of temperature, moisture, light, etc. within which organisms are able to survive
2. _____ biological communities tend toward maturity
3. _____ waters of the earth, their life-history, etc.
4. _____ bacteria and fungi
5. _____ green plants
6. _____ environmental system free from human influences
7. _____ conversion of light energy, water and CO_2 into organic carbon compounds and oxygen in green plants
8. _____ exchange of "lumps of water" back and forth in bodies of water
9. _____ special molecules found in every body cell; dependent upon phosphate
10. _____ thin, continuous film of living organisms encircling the earth
11. _____ ground water picked up by roots of vegetation and returned directly to the atmosphere
12. _____ study of life in inland (fresh) waters
13. _____ rain forests, deciduous forests, tundra, ocean depths, deserts, shallow tropical seas, etc.
14. _____ assemblage of interacting and interdependent organisms of different species relatively independent of outside organic influences
15. _____ mutually dependent relationships between different kinds of organisms

A. Transportation
B. Energy Carriers
C. Biosphere
D. Limnology
E. Photosynthesis
F. Hydraulic Mixing
G. Secondary Producers
H. Lithosphere
I. Natural System
J. Ecological Succession
K. Environmental Tolerance
L. Raw Materials
M. Respiration
N. Halitosis
O. Primary Producers
P. Hydrology
Q. Ecosystem
R. Decomposers
S. Biological Community
T. Atmosphere
U. Transpiration
V. Symbiosis
W. Biomes
X. Trichinosis
Y. Aquatic Ecosystem
Z. Solubility

Appendix 4(a).

Student Evaluation Form
MAN AND THE ENVIRONMENT
(Spring 1971)

Would you please take this opportunity to "grade" this course that you have just completed. We would appreciate comments you can make that would facilitate improvement.

	EXCELLENT A	ABOVE AVERAGE B	AVERAGE C	BELOW AVERAGE D	FAILURE F	NO COMMENT
READING MATERIAL						
Bates The Forest and the Sea						
Cole The Ecosphere						
Crowe Tragedy of the Commons Revisited						
Deevey The Human Population						
Disch The Ecological Conscience						
Ehrenfeld Biological Conservation						
Hardin The Tragedy of the Commons						
Sears The Ecology of Man						

Comments or Suggestions

SOME PRINCIPLES OF ECOLOGY						
Amount of material						
Correct level of presentation						
Success in helping you learn the subject matter						
Relevancy						

Comments or Suggestions

	A	B	C	D	F	NO
HISTORICAL, CULTURAL & ECOLOGICAL DEVELOPMENT OF MAN						
Amount of material						
Correct level of presentation						
Success in helping you learn the subject matter						
Relevancy						

Comments or Suggestions

FIELD TRIP						

Comments or Suggestions

FINAL PROJECT						

Comments or Suggestions

INFORMAL CLASSROOM DISCUSSIONS						

Comments or Suggestions

INSTRUCTORS						
Helpfulness						
Knowledge						
Enthusiasm						
Ability to Communicate						

Comments or Suggestions

OTHER COMMENTS OR SUGGESTIONS

Would you advise a friend to take this course? YES NO

Appendix 4(b).

Student Evaluation Form
MAN AND THE ENVIRONMENT
(Winter 1972)

Please circle what you feel is an appropriate evaluation for each item requested below. Your comments are particularly appreciated.

		Comments
READING MATERIAL		
The Forest and the Sea	A B C D F	
The Ecosphere	A B C D F	
Man and the Environment (Boughey)	A B C D F	
Man and the Environment (Jackson)	A B C D F	
CLASS LECTURES		
Amount of Material	A B C D F	
Correct level of presentation	A B C D F	
Success in helping you learn the subject matter	A B C D F	
OUTSIDE SPEAKERS		
Environmental Trade Assn.	A B C D F	
Georgia-Pacific	A B C D F	
Portland General Electric	A B C D F	
GROUP PROCESS	A B C D F	
BOOK REVIEWS	A B C D F	
EVENING MEETINGS WITH INSTRUCTORS	A B C D F	
CLASS DISCUSSIONS	A B C D F	

MIDTERM EXAMINATION	A B C D F
FIELD TRIP	A B C D F
ATTENDANCE AT OUTSIDE SEMINARS	A B C D F
FINAL GROUP PAPER	A B C D F

INSTRUCTORS

Helpfulness	A B C D F
Knowledge	A B C D F
Enthusiasm	A B C D F
Ability to communicate	A B C D F

OTHER COMMENTS OR SUGGESTIONS

Would you advise a friend to take this course? YES NO

Course Materials

MAN AND THE ENVIRONMENT
GS 230X 1972

COURSE EVALUATION AND REQUIREMENTS

There will be several examinations and group reports required in this course. The midterm examination and the final examination will be graded and recorded on an individual basis, the group products will be graded as a group with each member of the group receiving the same score.

The Midterm Examination will be based upon the following sources of information and will be evaluated on the basis of 30 points.

Class lectures
Boughey. Man and the Environment Chapters 1-6
Bates. The Forest and the Sea
Cole. The Ecosphere. Scientific American, April 1958. Reprint 144
Jackson. Man and the Environment, Section I, Human Behavior

The Final Examination will be based upon the following sources of information and will be evaluated on the basis of 20 points.

Boughey. Man and the Environment Chapters 7-14
Jackson. Man and the Environment Assigned selected readings
Class lectures

The Group Product will be based upon the following activities and will be evaluated on the basis of 50 points; however, one-half of those points will be reserved for distribution by members of the group based upon the criteria provided you on the next page.

Example: A group of 5 members receives a score of 20 on the group product. Each member of the group will receive that score. In addition, the group will receive 20 x 5 (the number of members) for distribution on a percentage basis to individual members of the group. The percentage each member receives will be based upon his participation in the group as determined by using the criteria mentioned above.

THE GROUP PRODUCT

The group product will consist of several parts, each typed with double-spacing. These parts are:

1. An ESSAY entitled, "The United States of America, 2001". This essay should be based upon course resources listed above as well as outside reading and invited speakers. (Approximately 10 pages)
   An additional handout will explain this more fully.
2. An acceptable BOOK REVIEW from each member of the group. The dates that these are to be submitted are listed in

the class schedule. Unacceptable book reviews will be returned to the group for rewriting, so the final draft should be approved by each member of the group prior to submission.

3. ATTENDANCE by at least one member of the group at a relevant meeting, speaker, or seminar. The instructors will provide information as to the time and place of appropriate meetings, but group and individual initiative is encouraged in selecting them. The member(s) attending are obligated to share information with other members of the group.

   At least one meeting of the group per week outside of class time normally will be required in order for the group to share in the book reviews and reports of weekly attendance at an outside activity.

4. The QUARTERLY REPORT which should be a synthesis or reconciliation of what was accomplished during the quarter by the group.

As a record of the weekly meetings and as a means for periodic involvement of the instructors with individual groups, each group will be asked to turn in a 4x5 index card each Friday meeting of the class. The card should be typed and have on it the following information:

a. a list of the outside activities attended by members of the group
b. the time and place of the group meeting and the members attending
c. a brief description of the activity of the meeting
d. the time and place of the next group meeting

CRITERIA FOR GROUP POINT DISTRIBUTION

The criteria listed below can be modified by group consensus and with the knowledge of the instructors.

ATTENDANCE
Scheduled class meetings, group meetings, outside activities

PREPARATION
Reading resources
Completing group assignments on time

PARTICIPATION
Everyone reads and approves the group products prior to turning them in
Contribution to the group discussions
Sharing organizational responsibility of the group (Typing, meeting place and time, etc.)

Appendix 5(b).

Course Schedule

MAN AND THE ENVIRONMENT
GS 230X 1972

January	(5)	Introduction
	7	Attitude survey and Pre-test
M	10	Anthropological background for MAN-NATURE interaction
	(12)	
	[14]	
M	17	Some ecological principles
	(19)	
	(21)	
M	24	
	(26)	
	[28]	Man and Nature -- Case Histories
M	31	
February	(2)	
	(4)	Some ecological principles
M	7	
	(9)	Field Trip
	[11]	Midterm Examination
M	14	Population
	(16)	
	(18)	Outside invited speakers Group evaluation of selected readings Class and group discussions
M	21	
	(23)	
	[25]	
M	28	
March	(1)	
	(3)	
M	6	
	(8)	
	△10△	

KEY

( ) Two-hour class meeting
□ Dates for cards
○ Dates for book reviews
△ Final Group Product due

Final Examination Schedule - Tuesday 14 March 72 1900

51

Appendix 5(c).

Book Reviews

MAN AND THE ENVIRONMENT
GS 230X 1972

Book reviews are due on Jan. 21
Feb. 4
Feb. 18
Mar. 3
Mar. 10

A book review is required from each member of a group. We would expect that one member of the group read a book, discuss it with other group members at the weekly meeting, then write up a critical book review based, in part, on the group's comments. A critical review means that you examine the author's intent in writing the book, what are his biases, did he do a good job, was the material handled well, was he objective in his dealings with controversial subjects. Examine what an author says he is going to do, then whether or not he did what he said he was going to do and finally, how well did he do the job.

The review should be typed, double spaced and approximately two pages in length. Every member of the group should sign each paper so instructors will know that all group members are aware of the contents of the paper being submitted. The review will be given a satisfactory or unsatisfactory grade. If it is unsatisfactory, it will be handed back to the group and must be submitted again.

Following is a list of books that we feel are worthwhile to examine. The list is not exhaustive by any means. If you are aware of other books that you would like to review, please get the approval of one of the instructors before you get involved in it.

Borgstrom, George (1969)	Too Many
Commoner, Barry	Science and Survival
Commoner, Barry	The Closing Circle
Carson, Rachel	The Sea Around Us
Carson, Rachel	The Living Tide
Carson, Rachel	Silent Spring
Dickenson, K. E.	Chemicals and Life
Dubos, Rene'	So Human an Animal
Ehrlich, Paul and Hariman, Richard (1971)	How to be a Survivor
Elder, Fredrick (1970)	Crisis in Eden
Graham, Frank	Since Silent Spring
Henshaw, Paul S.	This Side of Yesterday

Leopold, Aldo	A Sand County Almanac
Mesthene, Emmanuel G.	Technological Change
Mowat, Farley	Never Cry Wolf
Ridgeway, James (1970)	The Politics of Ecology
Riech, Charles	The Greening of America
Roueche', Berton	What's Left
Rudd, Robert L.	Pesticides and the Living Landscape
Sears, Paul	Where There is Life
Tofler, Alvin	Future Shock
Tydings, Senator Joseph (1970)	Born to Starve
Udall, Stewart	The Quiet Crisis
Westoff, L. A. and C. F.	From Now to Zero: Fertility, Contraception, and Abortion in America
Yates, Wilson (1971)	Family Planning on a Crowded Planet

Current Outside Activities

MAN AND THE ENVIRONMENT
GS 230X 1972

Sls-507 Land Use Seminar

January 10	"Public Health: Solid Waste", Robert D. Jackman, Solid Waste Division, Department of Environmental Quality, Portland
January 17	"Evaluation of Terrain for Landscape Stability or Seismic Hazards in San Fernando Valley", Dr. Leonard A. Palmer, Environmental Geology, Portland State University
January 24	"Engineering Uses and Problems", Dr. J. R. Bell, Department of Civil Engineering, Oregon State University
January 31	"Planning Programs and Problems in the Corvallis Area", Virgil Adams, Corvallis Planning Department
February 7	"Land Use and Forest Management", J. R. Dilworth, Forest Management, Oregon State University
February 14	"Planning with Nature", Dr. Ronald Lovinger, Landscape Architecture, University of Oregon, Eugene
February 21	"Involving the Community in Land Use Planning", Wilbur L. Bluhm, Extension Agent, Oregon State University, Salem
February 28	"State Land Use Planning and Senate Bill 10", Richard Jentzsch, Local Government Relations Division, Executive Department, Salem
March 6	"National Land Use Problems and Programs", Robert M. Alexander, Director, WRRI and Air Resources Center, Oregon State University

All meetings will be at 3:30 - 4:30 p.m. in Room 211, Agriculture Hall. This is a one (1) credit course and can be included as part of the Water Resources minor.

January 26 (Wed.) 7 p.m. Pharmacy 305
Dr. Len Palmer, PSU geologist, "An Environmental Approach to the San Fernando Earthquake".

February 27 (Wed.)	7 p.m. Pharmacy 305 Mr. Richard Bowen, geologist, Department of Geology & Mineral Industries, "History and Production of Geothermal Power: The Environmental Impact".
March 9	Man-Induced changes in some New Zealand Ecosystems, Graham Will, 1530, Cordiey 2113.

City Council
1st & 3rd Mondays, 7:00 p.m.
City Hall

City Planning Commission
1st Wednesday every month
7:30 p.m., Council Chambers
City Hall

County Planning Commission
4th Tuesday
Circuit Court Room
County Court House

County Commissioner
Every Wednesday morning, 10:00 a.m.
Room 101
Benton County Court House

Any other speakers or meetings on or off campus that pertain to the subject, MAN AND THE ENVIRONMENT.